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Anaesthesia and Narcosis in the Horse*

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WHEN the University of London did me the honour of inviting me to lecture to you on some aspects of veterinary surgery, I felt, firstly, that I should select those of which I have had considerable personal experience so that I could describe the problems they present to me, and secondly, choose subjects relating to the larger of the various species we deal with ; for it is my belief that, speaking generally, the larger the animal the greater are the difficulties we encounter. One of the subjects I have chosen relates to the horse. I am aware that this species has largely ceased to play an important part in our national economy, nevertheless, there are still many horses kept for pleasure, particularly in country districts and I think this number will continue. Thus it is imperative that those of us engaged in country practice shall be competent horse surgeons and this entails a detailed knowledge of the anaesthetic methods which may be suitably applied to them. They comprise very largely thoroughbred horses in the breeding and training areas ; hunters, steeplechasers, jumpers and children's ponies in the country generally. I am not one of those who subscribes to the view that the time has now come when, for efficient animal surgery, it is imperative to have present a specialist anaesthetist whose sole task throughout operation is to attend to the anaesthesia. I don't think that that time will ever come for the great majority of animal operations, and thus the veterinary surgeon will have to take the anaesthetic aspects of his task in his stride with no more than relatively minor assistance. Again I think we should relate our anaesthetic methods to the surgery we are likely to be called upon to perform, rather than review the subject from a purely pharmacological or theoretical viewpoint. You are aware that, as compared with some of the other domestic species the field for surgery in the horse is restricted. This is in no small measure due to the fact that it is essential that an injured or diseased horse shall be restored to normal function, especially locomotor function if it is to remain of use, something which, from the very nature of the lesion it has sustained, may be impossible. You will not need reminding that the very valuable horse is only very valuable so long as it is capable of perfect performance. Once this is lost its value is negligible. Extensive and costly surgery is only justified provided one is reasonably certain of complete success. Lest we to-day tend to preen ourselves, let me say at once that the operations we perform are much the same as those which were being done by equine surgeons nearly 100 years ago. The field has not been materially increased ; in fact by the elimination of certain types of horse it has become narrowed. We can only hope that while performing the same operations in much the same way we have improved surgical technique, our anaesthetic methods are safer and more certain, we are cleaner and gentler, our after-treatment is more rational, so that we have a higher recovery rate and a reduction in the degree of post-operative malaise and recovery time.

Reviewing the cases with which I have been associated at the Liverpool Field Station during the past 16 years, I find that 420 horses were operated upon in the cast position under general anaesthesia or under deep narcosis augmented by local anaesthesia. As you would expect castration was the most frequent indication and represented 31 per cent. The pattern,

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however, was somewhat different from that seen in general practice in that the majority were horses of 2 years old upwards, while almost half of them were cryptorchids. Operations for wounds and sepsis were second comprising some 16 per cent. (This, of course, is a tremendous field and represents surgery of widely varying delicacy, severity and duration.) Progressively down the list come operations for fistulous withers and poll evil, for roaring, neoplasia, umbilical hernia, eye and dental cases, ovariectomy, " champignon " and scirrhous cord, the facial sinuses and sundry cases of inguinal hernia, prolapse of the rectum, shoulder tumour, laceration of the perineum and vaginal windsucking, calculus of the urinary bladder in the mare and of the urethra in the gelding and others.

The great majority of our operations on horses are performed quickly, in fact much of our success as surgeons relates to the speed at which we work, and interferences occupying more than half an hour were exceptional. Moreover, more than half of them were performed in a field. I would stress this point. For the majority of horses operating theatres are quite unsuitable ; I refer particularly to partially broken youngsters and to big hunters and chasers, for if they are to go down and rise again with reasonable safety, it is essential that there shall be plenty of space available. In addition the ground surface must be suitable. The best place to deal with them is at grass and we must relate our anaesthetic methods to their use in the field.

Anaesthetics, as we understand them, were first introduced into surgery in the 40s of the last century ; Morton, in America, who used ether in dental surgery and Simpson, in Edinburgh, who employed chloroform in human obstetrics. Veterinary surgeons were keenly aware of these matters, and it is probable that the first occasion on which an anaesthetic was administered to a horse was here in London towards the end of 1847. We are fortunate that there exists a vivid and detailed description of what occurred. It comprises an editorial article in the January issue of the *Veterinarian* of 1848. I shall read it to you.

> " The conversation the other evening, after the Council meeting had broken up, turning on the possible effects of chloroform, it being just about the time the publicity was given to Professor Simpson's experiments, Mr. Goodwin, veterinary surgeon to the Queen, informed those present that he had a horse—lame from navicular arthritis, at the Royal Mews, which he would be happy to make the subject of any trial of the kind. Accordingly, a day was fixed and Messrs. Wilkinson, Henderson & Percivall attended to witness an experiment promising to be of an unusually interesting character. The animal, a fine sleek-looking bay carriage horse, evidently lame, came snorting and prancing out of his stable full of health and vigour, and was led at once into the riding school. Though naturally quiet and good tempered, still, from his present buoyancy of spirits, it required some courage on the part of the strangers present to approach him. Such being the case it became a question how or in what manner the chloroform was to be applied, so that he might effectually inhale its vapour. After some pro and con observations and suggestions, it was decided to send for a common leathern muzzle and to affix to such parts of it as were, when the muzzle was applied to the head, directly opposed to the nostrils, two pieces of sponge each of sufficient magnitude to imbibe an ounce or more of liquid chloroform. This was done, and the muzzle so fitted up, put on. Everything being adjusted about the head, chloroform liquid from a bottle was poured first upon one sponge and afterwards upon the other, out of a bottle containing 3 oz. of the fluid until about two-thirds of the entire quantity (an ounce on each sponge) had disappeared. The operation of pouring being finished, the groom who had hold of the cavesson, by which the animal for fear of accident had been secured with a view to rendering the inhalation more effective, of his own accord at this time pressed the muzzle upwards and so forced the sponges against the nostrils, a compression which caused some of the liquid to drop out from below ; scarcely, however, had this been done twice when the animal, who had at that moment been manifesting some increased vivacity, all at once threw up its head, became vertaginous, staggered from side to side and in a moment afterwards reared up, and, in convulsion reeled backward from the middle of the school, where he had been standing, against the panelled side of it behind him, striking his head against the panels with a force truly tremendous, frightening every person around him. The groom, holding the rope of the cavesson, exerted himself to save the animal and in his efforts, fortunately perhaps for the horse at the moment, hauled cavesson, bridle and muzzle together off the animal's head, the only hold remaining being the retention of the snaffle bit within the mouth and that was owing to the clenching of the jaws. At this period the horse had the aspect of one momentarily struck by tetanus. There was a wild, senseless, ghastly stare ; the stiff, outstretched limbs ; the body remaining supported by its hind quarters against the boards. And now the animal was pricked about the neck and body with a pin but evinced not the slightest feeling, nor even his lips evinced more than a convulsive twitch when they were likewise punctured. His pupils were dilated. His pulse was distinct though weak at the jaw and was not in the first instance accelerated, though it rose considerably afterwards. Not more than half a minute elapsed after the sponges were pressed against his nostrils before the animal showed himself affected by the chloroform, and in the next half minute he was in convulsions. In consequence of the muzzle having come off in the act of reeling, total insensibility did not continue longer than a couple of minutes. From that point the pulse gradually but rapidly increased in frequency, quickly becoming 60, 80, 100, 120 ; while all the time consciousness and sensibility were found returning and along with it unnatural heat of the

skin over every part of the body. In about 5 minutes after sensibility had returned, the animal appeared and proved sufficiently recovered to have his cavesson and bridle adjusted and to be slowly walked around the school. In half an hour afterwards he was returned to his stable and was eating with his wonted appetite his noon feed, nor did he appear aught worse whatever from the experiment which had been practised on him."

The most important lesson to be learned from that early experiment is the violence of the narcotic excitement which the chloroform provoked. Horses to-day are no different from then nor, for that matter, is chloroform. Interest in the subject was intense and considerable ingenuity was exercised in the development of more satisfactory masks. In the same year we find Mr. William Field, of London, describing a mask possessing a perforated metal canister in which to house the sponge to prevent any liquid chloroform coming into contact with the nostrils. Field's conclusions are instructive : " However satisfied I may feel about the power of chloroform over the horse as an anaesthetic agent, I cannot think of using it for casting in lieu of hobbles. A serious objection to its use before casting is that the fall of the animal is too uncertain to admit of restraint or limitation and consequently violent injury may result in the struggles and staggerings preparatory to its fall, as well as in the fall itself." In my view, we must consider these early warnings carefully for even to-day when we use anaesthetic drugs less likely to cause excitement, their administration in the standing position will always be associated with risk. It must at once be acknowledged, however, that the forcible casting of the fully conscious horse also entails risks and it becomes a matter of careful assessment, in relation to the individual animal being dealt with and the quality of the assistance available, which is the greater risk. But we cannot yet leave those early years for Mr. Samuel Peech, of Rotherham, also in 1848, writes : " In my opinion it is very doubtful whether chloroform will ever become an efficient agent in veterinary practice on the horse as the animals on which I used it suffered more in being reduced to a state of insensibility and in recovering from that state, than they did from the operations performed (neurectomy)." There are many of us to-day who would, I think, go a considerable way in support of Mr. Peech's view.

Frederick Hobday, whose name I am sure will be familiar to you all, and who was one of our greatest operative surgeons, was keenly interested in anaesthesia. For the horse he considered chloroform to be the most satisfactory but he always cast and restrained the animal prior to its administration so that induction could be controlled and struggling reduced. As the Professor of Surgery in this College he employed the method up to the time of his retirement in 1938. I and my student contemporaries were taught to administer chloroform to the horse in the cast position by another of our great surgeons—Brayley Reynolds.

This view, however, was not accepted by all and there were still many veterinary surgeons in the country who administered chloroform in the standing position maintaining that having regard to all the factors involved, this was still the best method. Richard Roberts, of Tunbridge Wells, was prominent among them. These men, however, were concerned chiefly with farm colts for castration whereas Hobday and Reynolds dealt extensively with adult hunters and thoroughbreds. I would say here, and I shall say it again, that it is very unlikely we shall obtain the same results in these big, strong creatures that we did in small or immature animals which are much more easily controlled, and thus our conclusions in regard to a method must relate to the difficult horse as well as to the easy one.

But quite apart from the excitement and struggling which occurred, the method had other serious objections. Not infrequently when dealing with big horses it was most difficult to obtain anaesthesia by the periodic application of chloroform to a sponge through which the animal was both inspiring and expiring air. In fact in order to obtain an adequate concentration of chloroform vapour to induce anaesthesia in a period of 8 to 10 minutes, Hobday used to wrap the mask in a blanket thus greatly reducing the air intake. Moreover, having induced anaesthesia it was difficult to maintain it at an even depth by the rather haphazard method of adding more chloroform to the sponge from time to time. Such factors as these did much to encourage speedy operating and one of the striking features of the work of the old operators was the speed at which it was performed. Veterinary surgeons at the time recognised the coarseness of the method and many improved masks were introduced provided with expiratory valves and extra-air inlets but the principle of applying chloroform in large doses to a sponge or cotton-wool generally persisted. A departure from this was the ingenious mask introduced by Imrie, of Glasgow, in 1920. Made of canvas and metal and fitted with inspiratory and expiratory valves, it possessed a carburettor-like container for the chloroform which dripped into the air in-flow at a controlled rate. He used it with considerable success in both the standing and cast positions.

One of the outstanding advantages of the inhalation anaesthetics is the rapidity with which they are excreted once administration ceases and hence the speed with which the animal regains consciousness and co-ordinated locomotor power, for even after lengthy interferences it is highly probable that the animal will be able to rise, stand and walk without difficulty some half an hour or so after completion. This is a matter of great moment in the horse.

In America masks were never popular and instead open methods such as that devised by Bemis were used. With the horse restrained in lateral recumbency, a single thickness of towelling was placed over the upper nostril. Upon this chloroform was dropped, slowly at first until the animal became accustomed to inhalation of the strange vapour, and later more quickly as it passed into the narcotic stage. To induce full anaesthesia by the method it was generally necessary in the later stages to plug the lower nostril. Anaesthesia was maintained by the further application

of chloroform to the towelling at the discretion of the anaesthetist. One of the difficulties when dealing with these large animals, and this is a matter to which I shall refer in greater detail later, is knowing when the animal is unconscious. This is especially the case in the horse in which subanaesthetic depths of narcosis may be associated with a state resembling natural sleep, a state in which the animal becomes acutely disturbed and the operator greatly surprised when operation commences.

But quite apart from these technical considerations, chloroform itself has many disadvantages. It is a highly toxic substance and deaths during the induction of anaesthesia from cardiac fibrillation and syncope were not uncommon and most of those who used the method had an occasional death from this cause. Furthermore, chloroform anaesthesia was frequently followed by a period of malaise and inappetence due probably to the toxic effect of the drug on the liver parenchyma. Finally, post-anaesthetic pneumonia sometimes occurred due to the irritant effect of the vapour on the lungs.

Chloral hydrate has long been used as a sedative, narcotic and general anaesthetic in the horse. As early as 1875 Humbert described the effects produced by doses ranging from 30 to 70 g. It is a drug the value of which is continually being rediscovered. In the early days it was generally administered by the mouth or *per rectum*, occasionally by intraperitoneal injection, with the object of provoking narcosis as an adjunct to local or inhalation anaesthesia. On the Continent experiments in intravenous administration in full anaesthetic doses had been carried out and we find Degive, a prominent Belgian professor, writing in 1908—" Chloral hydrate injected into the jugular vein of the horse in a dose of 10 g. per 100 kg. in a 20 per cent. solution in distilled water produces in 1 to 2 minutes complete general anaesthesia without causing preliminary excitement in the animal. The method is most valuable when practised with full aseptic precautions but it has been followed by several accidents which have put its value into doubt." Half a century later I have arrived at the same conclusion except to say that provided adequate technical care is exercised the doubt he expresses becomes removed. In fact even to-day, with the great advances in our knowledge of anaesthesia and anaesthetics, it is my opinion that chloral hydrate by intravenous injection is the best method of inducing general anaesthesia in the horse we possess, and most of what I have to say later will be a development of this view. Consequent, however, on the local risks associated with the injection of chloral solution into a vein many years were to elapse before the method became widely used, and when the drug was employed it was given by the mouth or stomach tube. Früs, a Danish veterinary surgeon, referring to work he had seen in Eberlein's clinic in Berlin, wrote in 1914, " In chloral hydrate veterinary medicine possesses a narcotic with incontestable advantages over chloroform, ether and morphine, and it is surprising that it is not more often used." The method he had seen used was to offer the drug well diluted in drinking water in doses of 20 to 70 g., after withholding water for 24 to 36 hours. It was found that about 75 per cent. of horses drank water so treated, while another 15 per cent. took it after the addition of bran. The remainder were drenched. It is of interest to note that when, accompanied by a group of students from this College, I visited the Berlin horse clinic in 1937, then in the charge of Professor Silbersiepe, the same method was being employed. One of the chief disadvantages of the administration of narcotics by the mouth to herbivorous animals is the great variation in the degree of individual response to a unit dosage, due in part no doubt to the variable state of the stomach contents at the time and also to the fact that the drug must traverse the liver before it enters the general circulation. (I would mention, in parenthesis, the example of the bull : While a dose of 90 g. given intravenously will bring a 15-cwt. animal to the borderline of general anaesthesia, as much as 180 g. may be necessary when given by the mouth to provoke even sufficient stupor to make handling of the animal safe and effective.) But lest I give the impression that British veterinary surgeons were backward in exploring the use of this clearly quite valuable drug let me refer to the work of the Royal Army Veterinary Corps Officers in the first world war. Gillett, Crawford, Malone and others were recording their experiences with the drug administered intravenously in the standing position and expressing most favourable conclusions. The types of horse they were dealing with were largely standardised ; adults in a weight range of about 9 to 13 cwt. The dosage they adopted was 2 to 2½ oz. (60 to 75 g.) for cavalry horses and 2 to 3 oz. (60 to 90 g.) for those of the field artillery. They make a point of the absence of excitement during induction and recovery. They acknowledged technical failure in a small proportion of cases and it must at once be stated that errors in injection may result in ruination of a horse consequent on an obliterating thrombo-phlebitis with or without infection. Such complications are less likely to have disagreeable repercussions when one serves in the Army than when one is engaged in civil practice and it is thus understandable that in general practice chloroform continued to be the equine anaesthetic of choice.

The work of Marcenac in France in the 30s again brought chloral hydrate into prominence and since that time I think it is true to say that it has been the most widely used anaesthetic for horses, certainly amongst veterinary surgeons in France and Belgium, South Africa, Australia and the United States, but still to a considerably less degree in the British Isles. Of recent years there has been a tendency to combine it with magnesium sulphate and/or the barbiturates.

I personally have been using chloral hydrate almost solely for the induction of deep narcosis or anaesthesia in horses for the past 20 years and in that time have so treated some 500 horses. They have comprised animals of all sorts and sizes. Two deaths have occurred ; both during the course of anaesthesia or narcosis, and in the early members of the series 3 cases of jugular thrombosis occurred due to technical error.

The advantages claimed for the method are :—

1. The regularity of response to a unit dosage by bodyweight.

2. The absence of excitement either during induction or recovery.

3. The wide safety factor in reasonably healthy subjects.

4. The absence of any post-anaesthetic nausea or malaise.

Against these must be set the following disadvantages :—

1. Satisfactory results are dependent upon perfect technique in relation to the injection, and the introduction of the chloral solution either into the wall of the vein or into the perivascular tissues will provoke serious consequences.

2. The duration of recumbency, 1½ hours or so after the induction of marginal anaesthesia and about 2 hours after full anaesthesia, is a significant inconvenience.

It will be noticed that I have referred to chloral hydrate as an induction anaesthetic. In the case of rapidly performed interferences such as castration, it is likely that the induction dose will suffice, or that in the case of longer but relatively simple interferences local anaesthesia will be used in addition. In cases in which more prolonged general anaesthesia is required such as operation for fistulous withers or intra-abdominal interferences such as cryptorchid castration or ovariectomy, it is not advised that additional chloral hydrate be used for the continuation of anaesthesia, for it must be borne in mind that being a halogen derivative the drug has a toxic effect on parenchymatous cells similar to that of chloroform, and thus a switch should be made to a relatively non-toxic inhalation anaesthetic or an ultra-short or short-acting barbiturate. My own practice is to maintain anaesthesia by the intravenous injection of thiopentone sodium or pentobarbitone sodium according to the anticipated duration of operation, most often the latter. The action of the two drugs used is a summative one and it is unlikely that the total duration course of recumbency will be significantly increased by the addition.

Two deaths due to chloral hydrate have been quoted : the first was an aged hunter gelding, a long-standing roarer, in which syncope occurred at the point of onset of anaesthesia. Pathological examination by one of my colleagues revealed long-standing degeneration of the myocardium. The second was an unbroken thoroughbred filly in which operation was for the removal of an ulcerating fibro-papilloma on the face. Administration was in the standing position. The animal floundered and fell in a state of medium narcosis after a dosage of 3·8 g. per cwt.* had been given and after restraining her with hobbles it was decided to operate under local anaesthesia. During operation violent struggling occurred and the filly suddenly collapsed due to cardiac failure. It was my opinion that the heart, suffused with chloral hydrate solution, was unable properly to respond to the adrenaline stimulus. The lesson to be learned from the case was that it was dangerous to restrain an animal which is in a medium state of narcosis only. Administration should have been continued after applying restraint to the point of, at least, deep narcosis.

It has been found that a dosage of 6·5 g. per 50 kg., in horses in the weight range 9 to 13 cwt., which have not been fasted, will provoke a state just over or just under the borderline of consciousness. In heavier animals a slightly reduced dose will have the same effect, while in lighter ones rather more will be required, in fact for yearling horses a dose of 7 g. per 50 kg., is given. A point to be considered is the concentration of the solution in which the drug shall be used. The higher the concentration the greater will be the degree of local inflammation should technical error occur. Conversely, the lower the concentration the greater will be the volume to be injected, and when using the gravity method of injection (which I consider the only proper one) the time occupied in its administration may be inconveniently long. Ten per cent. is considered to be the optimum ; when dealing with a horse of 11 cwt. this represents about ¾ litre. The optimum time in which to induce anaesthesia is from 4 to 5 minutes and care should be taken when a horse struggles vigorously after casting that injection is made very slowly during this period. I greatly prefer administration in the cast and restrained position to the standing one, for in the former accurate penetration of the vein throughout injection is much more certain, the speed of injection can be more effectively controlled, while in the later stages the degree of narcosis can, with reasonable accuracy, be assessed and the total amount given thereby modified. The only horses in which I attempt to make the injection in the standing position are those in which, despite twitching, I am unable to apply hobbles. But quite apart from the dangers of technical error in the standing position, I regard the floundering which may be associated with the animal's fall a grave inconvenience. It has long been recognised that casting, particularly by the hobble method, is attended by a risk of fracture, particularly of the lumbar vertebral column. The accident generally occurs almost immediately after the animal falls and is due to powerful contraction of the longissimus mass with the limbs fixed. It is prevented by keeping the head and neck well extended during casting and until the horse is anaesthetised. Experienced assistance is essential. In the series of cases quoted here, it has occurred on one occasion and that could have been avoided had I not been so foolish as to allow a person of whose experience and reliability I was uncertain to take the head. Under ordinary circumstances I am blessed with an experienced and highly competent casting team.

The assessment of depths of narcosis and particularly of anaesthesia is much more difficult in horses than it is in the dog. You are aware that in the latter species we are able by observing the progressive relaxation of the jaws and tongue, the gradual depression of the pedal reflex and by the response of the iris, to assess quite accurately depths of general anaesthesia. In the horse the pedal reflex is out of the question. The sticking of pins into the skin of the legs while often affording good evidence that

* 1 cwt. = 50 kg.

general anaesthesia has not been attained is not reliable in determining its presence. Relaxation of the heavy jaw is not easy to assess accurately. One of the first indications that a horse is passing into a state of profound narcosis is that the eyeballs commence to rotate laterally. At first this movement is slow but as the stage of anaesthesia is reached it becomes faster. The condition persists with progressively deepening anaesthesia almost to the point of bulbar paralysis. Thus it is important to observe its onset for it is likely that from that point that an additional 1/8th to 1/10th of the dose already given will bring the animal to a state of anaesthesia. At the stage of deep narcosis also it is noted that if the tongue is withdrawn through the interdental space the animal is unable to replace it and also that there is no response to vigorous pinching. (In many superficial operations in which local anaesthetic will also be used, narcosis will not be deepened beyond this point for unless there is some severe pain stimulus there will be no movement.) In the horse the tail reflex is a lowly one which serves as a useful guide. If the tail is suddenly but gently raised there will be a definite response if deep narcosis only has been attained but this response will be lost with the onset of anaesthesia. In the gelding it will be noticed, just as anaesthesia is developing, that the penis is relaxing and slowly protruding from the prepuce. In the mare the lips of the vulva often relax and urine seeps away. The anus relaxes with the onset of anaesthesia although the sphincter reflex remains brisk. The corneal reflex although sluggish in anaesthesia can be provoked almost to the point of bulbar paralysis. Abdominal relaxation is marked. In light anaesthesia there is slight pupillary constriction but this may be impossible to determine because of the varying light intensities in which much of our horse surgery is performed. In deep anaesthesia there is marked constriction. In light anaesthesia the pulse rate is generally accelerated to from 60 to 80 beats per minute. (Should the use of muscle paralytics such as d-tubocurarine or succinylcholine chloride become popular in the horse we shall have to pay great attention to the so-called cardiac pain reflexes for otherwise I fear that surgery will be performed on animals far from adequately anaesthetised.)

The introduction of the barbiturates into canine surgery stimulated the hope that they would be similarly useful in the horse. Pentobarbitone sodium (nembutal) was the first to be used. If the drug is administered by slow intravenous injection in the cast position varying depths of safe anaesthesia can be induced without excitement and the unit dosage by bodyweight taken will be similar to that required by the dog ; the total dose for an 11-cwt. horse will be in the range 180 to 200 gr. Other than in foals and other very small horses, however, the use of the drug as a single anaesthetic agent is almost entirely ruled out in practice because of the delayed recovery period. According to the depth of anaesthesia initially induced, anything from 3 to 5 hours, or even longer, may elapse before the horse is able to regain and maintain the standing position. Moreover, the recovery period may be associated with vigorous narcotic struggling difficult to control. With thiopentone sodium the position is very similar when the drug is given to full anaesthesia by slow injection. The recovery period is more rapid than was the case with pentobarbitone but the tendency to excitement persists. Moreover, economic factors cannot be ignored in regard to the use of thiopentone in the horse. A number of veterinary surgeons (Boswell, Longley and others) speak highly of thiopentone administered intravenously to the horse in the standing position by the so-called quick-shot method. By this is meant the injection, in a time of about 10 seconds, of a dose which causes the horse immediately to fall to the ground. The dose given is generally considerably less than the full anaesthetic one and it is likely that shock plays a considerable part in the procedure. Moreover, not infrequently if the dose has been inadequate there is violent struggling without even transient anaesthesia developing. Other veterinary surgeons (Henderson and others) swear at the method and I am among them. In my opinion the place of the barbiturates in equine anaesthesia is as continuation or deepening anaesthetics and in these connections I use them widely. For abdominal operations such as ovariectomy or cryptorchidectomy, it is my practice, having induced light anaesthesia with chloral hydrate, to deepen and maintain it by the intravenous injection of pentobarbitone sodium. In a horse of 11 cwt., to which chloral hydrate in a dosage of 6·5 g. per cwt. has already been given, an initial dose of 20 gr. of nembutal is injected in a time of about 1½ minutes. Should sluggish response to stimuli persist or return an additional 10 gr. is injected as required. In prolonged operations such as that for supraspinous bursitis as much as 60 gr. has been given during its course. The action of the two drugs is summative, each will be detoxicated or excreted separately and the total recumbency period will not be significantly greater than would have been the case with chloral hydrate alone.

I do not propose to refer at any great length to Betanaphthoxyethanol (Anavenol) as an anaesthetic for the horse for I do not think the drug has any place in this species, although originally it was introduced as a short-acting anaesthetic for the horse and extravagant claims were made for it. It undoubtedly has severe effects both on the circulatory and respiratory systems and deaths have occurred in horses directly ascribable to its toxicity. There is some doubt as to whether the apparent loss of consciousness it produces can properly be classed as anaesthesia, while in some instances it provokes either violent excitement or no apparent action at all. In recent statements circulated by the makers it is described as an anaesthetic for cattle and other ruminants " and has also been successfully used in horses." " If the injection is given too quickly (in less than a minute) overdosage may occur and cause cardiac or respiratory distress or even failure. But when used properly (an anaesthetic dose injected in from 1½ to 2 minutes) Anavenol is well tolerated by sound animals and if the correct rate of injection is adhered to, they control their own dosage by going down when they have received sufficient to induce light anaesthesia. Particular care is necessary when deepening anaesthesia with supplementary doses." This perfection of speed becomes a little difficult

to assess when it is acknowledged that there is some individual variation in response of individual animals, and moreover, as one with a wide experience of intravenous injection in horses I must confess to finding difficulty in attaining this perfect speed of injection in young or fractious horses in the standing position. Their final statement is "As with all general anaesthetics, the use of Anavenol is accompanied by some degree of risk, particularly in highly-bred horses." This is an implication which I do not accept. We have at our command to-day anaesthetic agents which, when administered with reasonable skill and care, are essentially safe even for thoroughbred horses.

With the introduction of chlorpromazine hydrochloride and its widespread use as a cerebral sedative in human surgery and, to a lesser degree, in the dog, it was hoped that it would prove similarly useful in the horse. Its relative lack of toxicity and simplicity of administration represented great advantages over chloral hydrate as a narcotic if it could be shown that it was equally effective. My colleagues, Owen and Neal, noted that a dosage of 0·8 to 1 mg. per kg. by intravenous injection and 1·5 to 2 mg. per kg. by intramuscular injection provoked, in the majority of cases, medium to deep sedation. There was, however, marked individual variation particularly when the intramuscular route was used, for while some animals showed deep sedation in others the drug provoked little or no effect. The full effect of the drug was seen in about 5 minutes after intravenous injection and in about 40 minutes after intramuscular injection. Moreover, there was considerable variation in the duration of action. After intravenous injection it persisted for from 5 to 8 hours, whereas after the intramuscular route it was delayed for from 12 to 24 hours in the majority of cases but on occasion lasted for as long as 40 hours. In one horse in which it was used as a precursor to general anaesthesia its action persisted for 60 hours.

The actions of chlorpromazine and its allied phenothiazine derivatives are most complex and differ in many respects from those of the aliphatic narcotics such as chloral hydrate and the barbiturates. They would seem to act by depressing the brain stem rather than the cerebral cortex and in addition to their hypnotic action have a depressant effect on muscle tone. There is debate among the pharmacologists as to the site of this muscle-depressing action but it is probably related to the motor tracts in the brain stem. It is significant that the action of curare and the curare-like drugs is potentiated by chlorpromazine.

In general the sequence of events in the horse after the administration of the dosage previously quoted, is as follows: an apparent unawareness of its surroundings and an indifference to interference provided the stimulus is only a mild one. Marked drooping of the head, ptosis, partial protrusion of the penis, the passage of flatus, and limb weakness as indicated by knuckling of the carpi and a tendency to sink at the hocks. In a loose-box the animal may support itself against the wall. From time to time it appears "to pull itself together," straightens up and commences to pick food, but its interest quickly flags and it droops again often with hay hanging from its mouth. Young animals, particularly foals and yearlings, may become recumbent and pass into a state resembling deep natural sleep. Generally, however, with vigorous stimulation a horse can be roused from chlorpromazine stupor and its response may be surprisingly agile. To one used to dealing with aliphatic narcotics the response of a horse to chlorpromazine may be confusing. The degree of muscle weakness is not a true indication of the degree of cerebral depression and some horses may react to this in an alarming manner by rearing, plunging and, perhaps, falling heavily. While such a state of affairs may be controllable in baby horses, in vigorous adults it may preclude the use of the drug.

Chlorpromazine potentiates the action of general anaesthetics. My experience has been that after chlorpromazine the quantity of chloral hydrate required to provoke light to medium depth general anaesthesia is reduced by about one-third. A grave disadvantage of the combined method, however, is that the horse may not be able to attain, and more particularly maintain, the standing position for 3 to 4 hours, and to attempt to stimulate it to rise too early is dangerous. Thus my experience leads me to believe that chlorpromazine has not the place in equine anaesthesia we had hoped for. There is, however, one indication in regard to which I am inclined to be less pessimistic. Like Professor Formston, I believe in castrating colts while they are still very young, at 5 to 6 months of age. In a limited experience I have found chlorpromazine in a dose of 0·8 mg. per kg. intravenously generally causes them to sink to the ground in a state of deep sleep. Castration under local anaesthesia is greatly facilitated. They generally rise quietly after an hour or so.

I must refer briefly to the use of ether in the horse. As it was one of the first anaesthetics to be employed in man you may think it surprising that I have not mentioned it before. The reason is that using the mask methods which had become the general practice with chloroform it was, to all intents and purposes, impossible to obtain concentrations of ether vapour in the inspired air sufficient to induce and maintain anaesthesia in the horse. Henkels in the Hannover School in 1938 was the first to devise an apparatus for continuous ether inhalation in the horse after the induction of medium to deep chloral hydrate narcosis. The method was a semi-open one, the animal inhaling air through warmed ether using a closely-fitting metal face mask fitted with inspiratory and expiratory valves. The volume of ether used for ordinary operations was from ½ to ¾ of a litre. During the past year two reports have been published on the use of a closed-circuit apparatus for the horse (Reed, Allen, Glasser & Keefe in the United States, and Fisher & Jennings in the Glasgow School). These are developments of the methods already widely used in man and small animals. In principle the two machines are similar, ether and oxygen being inhaled through a closed-circuit apparatus fitted with a 40- to 60-litre breathing bag and a soda-lime canister using a close-fitting face mask or a cuffed endo-

tracheal tube. The Glasgow workers first induce anaesthesia with thiopentone sodium while the Americans speak of premedication with tranquillisers and narcotics. So far the reports available comprise chiefly a description of the apparatus and give us very little detail in regard to the types of horse on which it was used, the quality of the anaesthesia obtained and the operations performed. As a surgeon I would like to know more about the horse. Nevertheless, I believe these things have a place in equine surgery performed in hospitals and more research will be welcomed.

Finally, I must say a word about the muscle-paralysing agents—curare and drugs with curare-like actions. It will be of particular interest to you that the first person to experiment with South American arrow poison as a remedy was William Sewell in this College in 1835. He used it in the treatment of tetanus in a horse and a donkey by implanting the arrow-head in the fleshy part of the shoulder. His work caused quite a furore at the time, both in veterinary and medical circles, but was soon forgotten to become, like so many things, rediscovered a century later.

It must be clearly understood that by the use of these agents an animal's ability voluntarily to respond to painful stimuli is overcome and also that the dose necessary to provoke flaccidity of the limb and abdominal muscles is very close to that which will paralyse the intercostal muscles and the diaphragm. The latter factor may be combated with relative ease by artificial respiration in man and small animals but we, at the moment, are concerned with horses.

In human surgery the purpose of the curare-like drugs is to provoke complete relaxation of voluntary muscle in planes of anaesthesia in which muscle tone persists although consciousness is lost. By so doing the least toxic anaesthetics may be employed in minimal quantities. It is, however, imperative to ensure that the person is fully unconscious for otherwise the operation will cause pain and shock.

It is my belief that in animals, with their less well developed cerebral function, it is less easy to obtain loss of consciousness by the use of cerebral depressants than would appear to be the case in man, and that the plane of depression necessary to provoke complete loss of consciousness in animals is itself associated with a marked degree of muscle relaxation. In fact, the onset of muscle relaxation is one of the best guides we possess that consciousness has been lost and conversely that the response of muscle to stimuli is the best indication that full anaesthesia has not been attained. There is, in my opinion, a grave risk that if muscle-paralysing agents are used in the horse in combination with the ultra-short-acting barbiturates, the phenothiazine narcotics or rapidly excreted volatile anaesthetics such as ether, they will serve to mask the fact that the animal is not properly anaesthetised. To this objection must be added the danger which apnoea represents, especially in the horse in which simple artificial respiration is unlikely to be effective and for which special artificial respiration apparatus may not be available.

I have to ask myself, have I in relation to the anaesthetic methods now available for horses found muscle tension a nuisance in surgical work ? The answer is, provided I have induced full anaesthesia, no.

May I very briefly sum up my views ?

1. The most satisfactory method we possess for inducing deep narcosis and light general anaesthesia in the horse is chloral hydrate administered by slow intravenous injection.

2. For deepening the induction anaesthesia and its maintenance for prolonged interferences, an ultra-short- or short-acting barbiturate is preferred to inhalation anaesthetics.

3. Whenever possible the horse is cast and restrained before administration so that injection shall be precise and the degree of narcosis assessed as administration proceeds. An efficient casting team is essential.

4. The method has two main disadvantages ; the first that great technical care is necessary during injection and secondly, the recovery rate is relatively slow.

5. In regard to chlorpromazine hydrochloride, the place it has in equine surgery is not established. Its use can be associated with danger to the animal.

6. In the present state of knowledge regarding the assessment of depths of narcosis and anaesthesia in the horse I would view the introduction of muscle-paralysing agents into horse surgery with grave misgiving.

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Thomas Burgess, D.D., F.R.S., 1756-1837—Bishop of Salisbury *

Initiator of the move within the Odiham Agricultural Society which led to the formation of the Veterinary College, London

BY

L. P. PUGH

FOR many years veterinary historians have accepted that the founding of the Veterinary College, London, in 1791 and thereby of veterinary education in this country, resulted from the activities of a special committee set up in London by the Odiham Agricultural Society in Hampshire, specifically to facilitate the Society's decision "to promote the study of scientific farriery in this country." The evidence on which these historians based their conclusion is contained in the first pages of a much-prized possession of the Royal Veterinary College of Camden Town—The Minute Book of the above-mentioned London committee—and consists of a series of abstracts from the original Minute Book of the Odiham Agricultural Society. Unfortunately, these abstracts gave little clue as to the initiator of the move, or to the people involved who were able in the short space of 6 years to bring to fruition the idea of a veterinary school in this country.

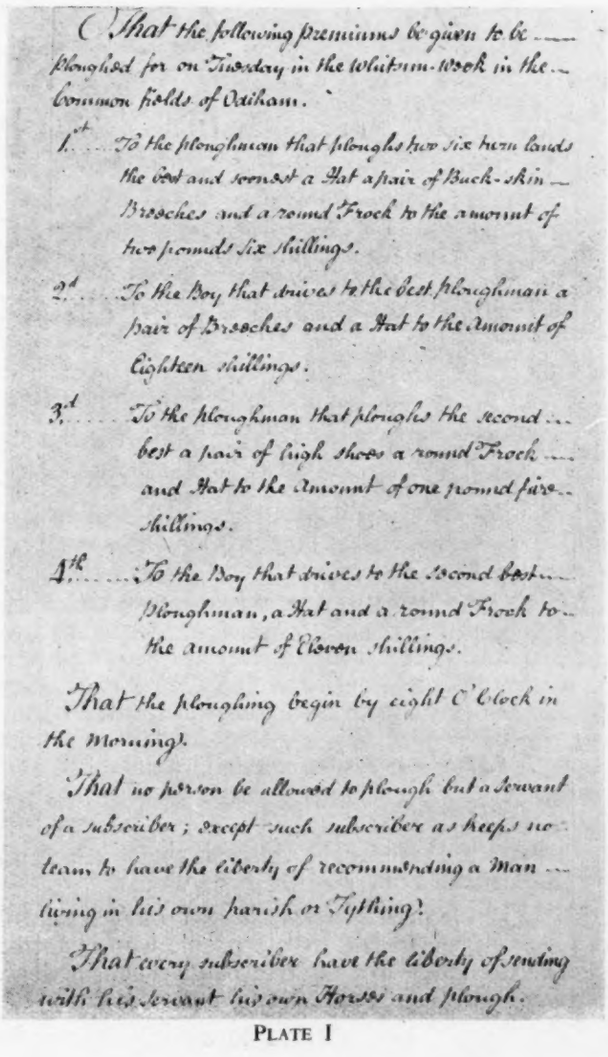
It was evident, therefore, that if more was to be known of the founding of the London Veterinary College, the Odiham Society's Minute Book had to be found. Such was the position up to the summer of 1956 when Mr. W. G. R. Oates, Registrar of the Royal College of Veterinary Surgeons, decided to spend a few days of his holiday delving into all likely places in the Odiham district to see if he could discover the book. By the greatest of good fortune, and as a just reward for his persistence, he succeeded in tracing it to a solicitor's office in Odiham. He persuaded the holders to put the volume on perpetual loan to the Royal College and thus made it available for study.

The first thing that struck one was the interesting fact that the volume is of identical make to the Minute Book of the London committee; that is, a folio one, with hand-made Whatman paper, full binding in reversed calf with blind tooling. This identity is perhaps explained by the fact that James Huntingford, the original secretary to the Society, became the first secretary to the London committee.

In certain respects the amount of fresh information on the farriery question contained in the new-found book is disappointing but, taken in conjunction with what was known from the London book it is possible to piece together a reasonable overall picture of the development. On one point, however, it is now possible to be quite definite—that the instigator of the move for the scientific study of farriery in its broadest sense came from one man and one man only —Thomas Burgess. (See Plate IV.)

It is of some interest to study the inceptive phases of this small agricultural society—its declared aims and ideals—which may have been a reflection from other similar movements.

Various agricultural societies developed in the latter half of the 18th century aimed to improve knowledge and education in regard to agricultural economy, not only amongst the landowners and bigger farmers, but also amongst the poorer members of husbandry. They purchased books and journals on agricultural subjects for their members, they encouraged correspondence with authorities in various branches and from other counties, and they promoted competitions and offered premiums for anything which was thought to lead to the advancement of agriculture or of rural crafts. (See Plates I and II.)



That the following premiums be given to be ploughed for on Tuesday in the Whitsun-Week in the Common fields of Odiham.

1st. To the ploughman that ploughs best six Acre lands the best and newest a Hat a pair of Buck-skin Breeches and a round Frock to the amount of two pounds six shillings.

2d. To the Boy that drives to the best ploughman a pair of Breeches and a Hat to the Amount of Eighteen shillings.

3d. To the ploughman that ploughs the second best a pair of high shoes a round Frock and Hat to the Amount of one pound five shillings.

4th. To the Boy that drives to the second best ploughman, a Hat and a round Frock to the amount of Eleven shillings.

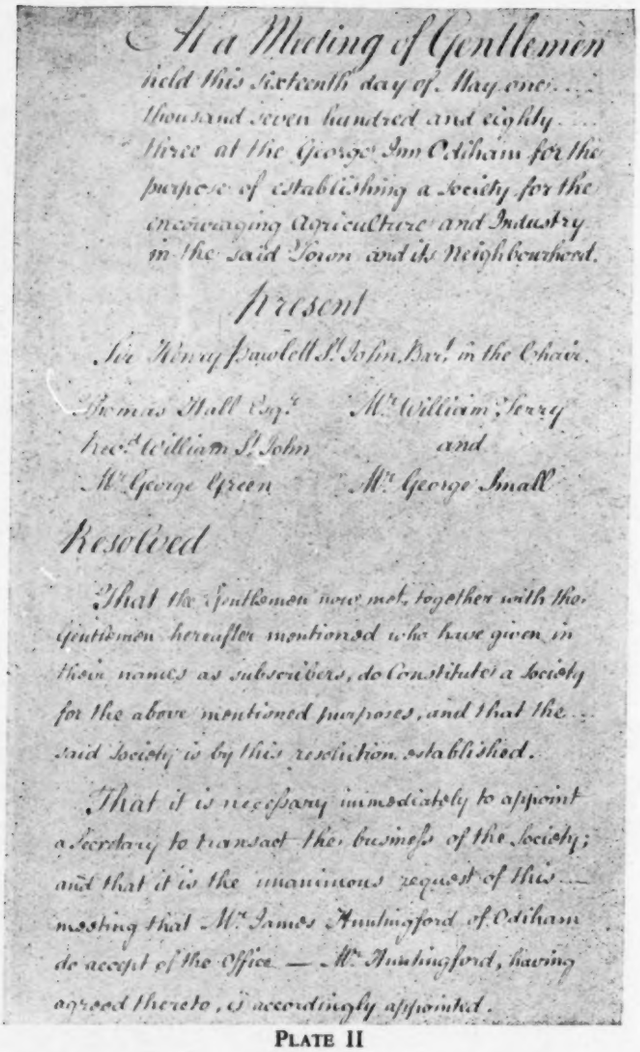
That the ploughing begin by eight O'Clock in the Morning.

That no person be allowed to plough but a Servant of a subscriber; except such subscriber as keeps no team to have the Liberty of recommending a Man living in his own parish or Tything.

That every subscriber have the Liberty of sending with his Servant his own Horses and plough.

PLATE I

* Presidential Address by Professor L. P. Pugh, to the University of Cambridge History of Medicine Society, March 4th, 1958.



At a Meeting of Gentlemen
held this Sixteenth day of May one
Thousand Seven hundred and eighty
Three at the George Inn Odiham for the
purpose of establishing a Society for the
encouraging Agriculture and Industry
in the said Town and its Neighbourhood.

Present

Sir Henry Paulett St. John Bart. in the Chair.

Thomas Hall Esqr. — Mr. William Terry
Revd. William St. John — and
Mr. George Green — Mr. George Small

Resolved

That the Gentlemen now met, together with the Gentlemen hereafter mentioned who have given in their names as subscribers, do Constitute a Society for the above mentioned purposes, and that the said Society is by this resolution established.

That it is necessary immediately to appoint a Secretary to transact the business of the Society; and that it is the unanimous request of this Meeting that Mr. James Anulmgford of Odiham do accept of the Office — Mr. Anulmgford, having agreed thereto, is accordingly appointed.

PLATE II

Among the 47 original subscribing members the names of the following appear:— Mr. William Burgess, Jr., of Odiham. Mr. John Burgess of London, and Mr. Thomas Burgess of Oxford.

Subsequent to the ploughing match mentioned above, the first General Meeting of the Society was held at the George Inn, Odiham, and on this occasion it was resolved:—

"That it is the opinion of this meeting, that Husbandry is of the utmost consequence as tending to the increase of population and riches of a Country; that every improvement in so useful an Art deserves encouragement, and that societies instituted like the present are calculated most effectively to excite emulation and call forth such improvements."

Within eighteen months the Society had over 100 subscribing members and the subscription was raised from five shillings to half a guinea, whilst life membership could be obtained for five guineas.

Early in 1785 the secretary drew up a "Sketch of the Institution' to send out to people who might be interested enough to subscribe or give benefactions. This report was "revised and corrected" by the Committee and then ordered to be printed. It is, however, too long to reproduce here in full, but the first two paragraphs are quoted to show some of the ideals to which the Society worked.

Odiham Agricultural Society

"To promote the good of the Community by the encouragement of industry and ingenuity; to excite a spirit of enquiry which may be productive of the most effectual improvements and lead to the most important discoveries; and to fix knowledge and art upon the certain test of accurate experiment, are the grand ends proposed by the institution of this Society.

"A desire to introduce into the neighbourhood of Odiham, those obvious advantages which the public have reaped and are daily reaping in the several parts of the kingdom, where societies of a similar kind have been formed, first excited the idea of the present establishment; and in support of it true public spirit has greatly distinguished itself—for a great number of Gentlemen of Rank, Fortune, and Ingenuity, as well without as within its limits, with many intelligent farmers and others, have very generously subscribed towards its advancement, and many of them have also dedicated much of their trouble to place it on a proper foundation, and to extend its views as opportunities have offered, though they can possibly have no other design in these their endeavours than that of promoting the benefit of Society at large."

With this brief introduction to the general background in which the Society was working, we can pass to the consideration of the Minutes of a meeting that took place at Odiham on August 19th, 1785. Here the Rev. Thomas Burgess delivered a memoir on several topics which was ordered to be entered in the correspondence books and made the following motion:—

"That Farriery is a most useful science and intimately connected with the Interests of Agriculture; that it is in a very imperfect neglected state and highly deserving the attention of all friends of Agricultural Economy.

"That Farriery as it is commonly practised is conducted without principle or science and greatly to the injury of the noblest and most useful of our animals.

"That the improvement of Farriery established on a study of the Anatomy, diseases and cure of cattle, particularly Horses, Cows, and Sheep, will be an essential benefit to Agriculture and will greatly improve some of the most important branches of national commerce, such as wool and leather."

Whereupon it was resolved:—

"That the Society will consult the good of the community in general and the limits of the Society in particular by encouraging such means as are likely to promote the study of Farriery upon rational scientific principles.

"That it be referred to the meeting in October to consider what means may be most likely to encourage the study of scientific Farriery.

"That it be referred to the same meeting to open a voluntary subscription to forward such means as may be thought most likely to promote the study of scientific farriery." (See Plate III.)

Here then is the evidence that Thomas Burgess

must be credited with being the prime instigator of the move which was to lead 6 years later to the formation of the Veterinary College, London. This naturally forces one to ask who was this man Thomas Burgess? Were these motions of his just flashes of inspiration? Did he pursue and support these ideas up to the time that the College was formed and its composition and constitution established?

It will be recalled that "Mr. Thomas Burgess of Oxford" was a foundation subscribing member of the Society. Within two years he appears in the records as the Rev. T. Burgess. This suggested the possibility that he had been studying for the Church at Oxford.

During this same period quite a number of subscriptions and benefactions emanating from Oxford University appear in the records. In the Minute Book of Corpus Christi College, March 7th, 1785, appears: "It was agreed to subscribe five guineas to the Agricultural Society established at Odiham

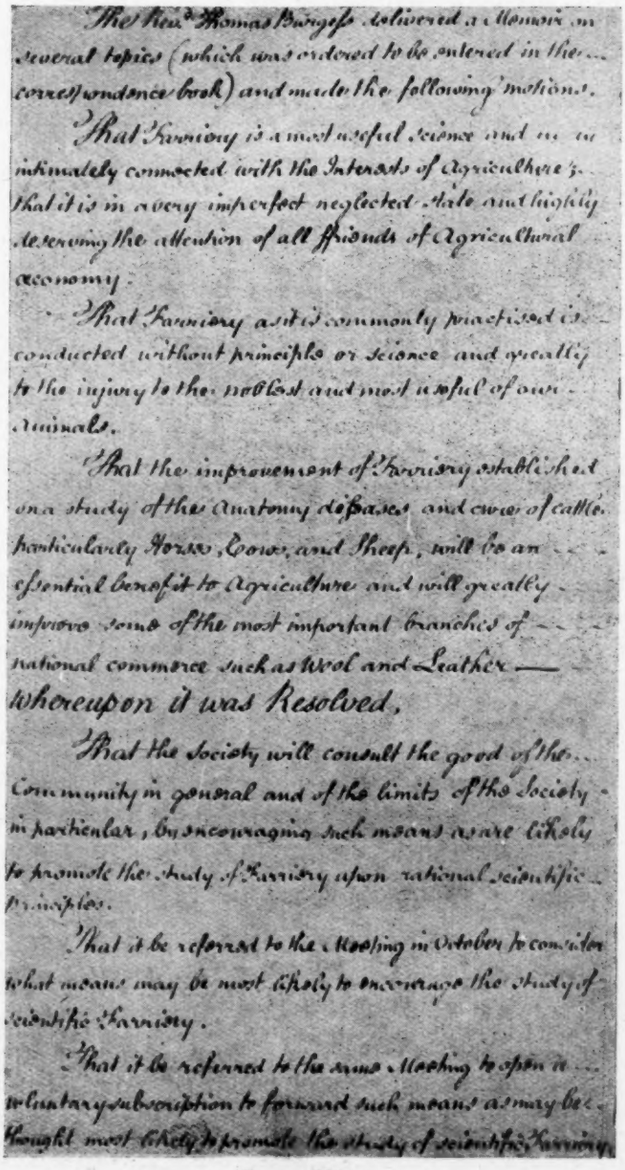


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PLATE III

PLATE IV

in the County of Southampton towards carrying into execution their very laudable schemes for the *Promoting Industry and Ingenuity*" and this sum was donated as from the President and Fellows of the College. From the College Register of Queens' College, January 23rd, 1786: "Agreed at a Meeting of the Provost and Fellows that a contribution of twenty pounds be given to the Odiham Society for the encouragement of Agriculture." In addition to these appear a number of anonymous benefactions from Oxford always through Thomas Burgess. It seemed reasonable, therefore, to suspect that someone at Oxford University was interesting himself very much on behalf of the Society and that Burgess might well be that person. Reference to Foster's *Alumni Oxoniensis* revealed that someone bearing that name had been Tutor and Fellow at Corpus at that period, that he subsequently became Bishop of St. Davids, and finally Bishop of Salisbury. The last fact enabled one to verify (from Harford's "Life of Bishop Burgess") that Bishop Burgess, at the time when he was Tutor of Corpus had shown great interest in the Odiham Agricultural Society. From this source and from the Dictionary of National Biography it was possible to build up the following picture of him:—

Thomas Burgess was born in Odiham on November 18th, 1756; the youngest son of William Burgess, Senior, who is described as having been "a respectable grocer—a man of excellent understanding and sincere piety—who was the object of his son's devoted affection." As a boy he first went to a dame's school (Mrs. Fisher's), and from there, at the age of seven years, to Odiham Grammar School. Here he won

a scholarship to Winchester in 1768. He gained a classical scholarship to Corpus in 1775, took his Bachelor's degree in December, 1778, and his Master's degree in 1782. He then became Tutor and was elected to a Fellowship of Corpus the following year. Ordained Deacon and Priest by Bishop Cornwall of Winchester in 1784, he continued as Tutor up to 1791, although at one period he nearly left the University through shortage of money. It is recorded that when at Winchester he was "manly and independent in his disposition but at the same time mild and inoffensive. He often found leisure to peruse in succession some of the best English classics." This early passion for literature made him regard men of genius or erudition with the greatest admiration.

His first four years at Oxford were devoted to hard reading and research into the Greek philosophers and poets, with special reference to the philosophy of language. After his appointment as Tutor, although of a retiring disposition, he gradually collected round him a select number of literary friends, including amongst these Dr. J. Routh, who later became President of Magdalen. In this connexion it is of interest to record that both Burgess and a Mr. Granville Penn kept up a literary correspondence with Dr. Routh to the end of his life. It is deemed possible that this mutual friendship may have been indirectly the means of Penn's becoming a subscribing member of the Odiham Society and later on instrumental in getting St. Bel's "Plan for Establishing an Institution to Cultivate and Teach Veterinary Medicine" accepted.

Throughout the Minutes of the Odiham Society one gets the impression of a greater emphasis on religion than appears to be the case in the contemporary agricultural societies. Moreover, there is a fairly constant reiteration of certain ideals, particularly in relation to the poorer members of agriculture. Having discovered the quality and eminence of Thomas Burgess one was naturally inclined to attribute much of this to Burgess's influence. In this one's inclination seemed reinforced on finding a letter written by him to one of his former pupils in which he writes, "Indeed I do hope that I shall have the pleasure of hearing you one day, spoken of as acting up to all the public duties which belong to your station and fortune; as a friend of the poor and uneducated, the patron of industry, and the promotor of useful experiments, and as contributing no common share to the aggregate of the exertions which are necessary to the happiness of your own neighbourhood, and the welfare and prosperity of your country." The substance and style of this letter, which was written in 1784, bear a strong resemblance to many of the minutes of the Odiham Society in subsequent years. The conclusion is warranted that Burgess was the dominant character of the Society, impressing his thoughts and ideals on those around him.

Burgess's life as Tutor, as Examining Chaplain to the Bishop of Salisbury, and as publishing various learned works on Greek philosophical questions would appear to be full—yet he found time to write religious books for children, "Salisbury Spelling Book." "The Child's First Book," "The Child's First Lessons in Religion, etc. His zeal for the promotion of Christian education of children of the labouring class was unbounded. He seemed to be quite indefatigable. One might well wonder why he spent time to attend and be interested in the activities of the Odiham Agricultural Society. The answer is simple. His mother, to whom he was devoted, was a confirmed invalid and he sought every opportunity to visit Odiham and cheer her with his talk.

In 1789 he published a treatise, "Considerations on the Abolition of Slavery and the Slave Trade, upon grounds of Natural, Religious and Political Duty." It was a very eloquent exposure of the futility of the arguments in support of West Indian slavery and, in fact, of slavery itself. His eloquence in our language can be gauged from the following abstract from his treatise: "This cause of human nature is brought before the tribunal of that nation, which has always been celebrated for its mercy; the cause of liberty is submitted to the arbitration of that country, whose freedom and happiness are founded on the general rights of mankind. And we cannot doubt that the great principles of political justice, which form the basis of our constitution, and which ought to come home to the breast of every British subject, will have their full weight in the deliberations of those august assemblies, which are to decide on a cause that involves the purity of our holy religion, and the credit and consistency of our national character."

These various references to Burgess's activities during his tutorship at Corpus are given to show his sterling qualities, and it is little wonder that a man who so continually cherished ideas of help to the inarticulate, the down-trodden, and the uneducated, should take up the cause of animals. It is all in keeping with his character and his profound Christian outlook on life and therefore not explicable just as a flash of inspiration.

The second query was whether Burgess saw his ideals through to a successful conclusion. The answer to this is definitely in the affirmative. He was active at all important phases right up to the establishment of the composition and constitution of the Veterinary College, London. He shared with Granville Penn and Charles Vial de St. Bel the credit of founding that College, each of these men contributing an essential part to the whole scheme.

The chief steps leading to this ultimate success were briefly: In May, 1788, the Society reached the decision that as there were no Schools of Farriery in this country, they would try to find a number of young men whom they would finance to send to the Veterinary School near Paris. To this end they broadened the terms of the Farriery Fund to read: "*Farriery Fund:* For the breed, management, and improvement of horses, cows, sheep, and hogs, for the best fully authenticated cures of diseases incident to horses, etc., for accurate registers of dairies—for registers of the management, profit and loss of a flock of sheep . . . at one guinea annually."

The scheme did not make rapid headway apparently through lack of sufficient financial support.

James Huntingford, the secretary, who had been so active in raising money during the earlier phases of the Society, had left suddenly under some sort of cloud (apparently not a financial one) and it is thought tnat this may have contributed to the tardy response.

In August, 1789, one finds little real change in the situation. The Minutes record " from the information collected on this subject it appears that the improvement of Farriery would be most effectually promoted by a regular education in that Art on Medical and Anatomical principles. It is to be lamented that there is not yet in England any Establishment adequate to the desired improvement of Farriery by a regular education in that Science."

The Society therefore still advocated sending " two or more boys " to be educated at the Veterinary School near Paris. However, by this time the Frencn Revolution had broken out and obviously frustrated their intentions. It was at this time that Granville Penn first entered the picture by becoming a full subscribing member of the Society. Granville Penn had been a member of Magdalen College, Oxford, studying classics. As a contemporary of Burgess and as a friend of Dr. Routh, it seems quite probable that he discussed the whole question of education in farriery with Burgess, since it is known that Penn had been interested in the subject for several years. Whereas Burgess was an idealist, Penn was essentially a realist who had travelled widely, and it is more than likely that when he met the émigré veterinary professor St. Bel he saw the possibility of combining Burgess's idealism with the severely practical approach of the Frenchman, who had drawn up a plan of teaching.

Sir Frederick Smith drew attention, in his " History of Veterinary Literature," vol. 2, 1930, to the fact that Penn must have realised that the country was not prepared for the scheme and that he therefore spent almost the whole of the year 1790 in propaganda letters in the *Gentlemen's Magazine*. Moreover, he re-drafted St. Bel's plan in a manner which he tactfully described as " better adapted to the customs and genius of the nation." Printed copies of the same were distributed to the various agricultural societies and to several influential thoroughbred owners during the summer.

On August 5th, 1790, the Society came to the conclusion that a veterinary school in this country similar to those that already existed on the Continent was necessary and, at the same meeting, they decided to set up a special committee in London to further this decision. Granville Penn was elected to it.

The first meeting in London took place on November 3rd, 1790, at the Prince of Wales Coffee House in Conduit Street, with Thomas Burgess in the chair, and it was following this meeting that James Huntingford (formerly secretary to the Society) entered the Farriery abstracts from the original Minute Book of the Society.

At a meeting on January 12th, 1791, at the Blenheim Coffee House, New Bond Street, Granville Penn (Chairman), Sir Wm. Fordyce, Thomas Burgess, St. Bel, and James Huntingford, it was resolved:—

1. To found a Fund by subscription.
2. To establish communications with the continental Veterinary Schools.
3. To build a Veterinary Hospital.
4. To promote Education in the Science of Farriery.

At a meeting of the London Committee held on February 18th, 1791, at the same place, they decided that the plans of the Odiham Agricultural Society and those of St. Bel should be consolidated into one. They then forthwith at the meeting decided " that they found it expedient to detach themselves from the Society" in order to give themselves greater freedom of action. They thereupon resolved:—

" That from this Day forward they shall be called by the name THE VETERINARY COLLEGE, LONDON.

" That M. St. Bel be appointed Professor to the College.

" That the Transactions of the College be published annually and a copy thereof delivered gratis to each subscriber."

A General Meeting of all subscribers to the Veterinary College was then called and held at the Blenheim Coffee House, New Bond Street, on April 8th, 1791, and the following Noblemen and Gentlemen were unanimously chosen President, Vice-Presidents, Directors, Treasurer, Professor, and Secretary for the ensuing year.

PRESIDENT

His Grace the Duke of Northumberland

VICE-PRESIDENTS

Rt. Hon. Earl Grosvenor	Sir George Baker Bart
Rt. Hon. Earl Morton	Sir T. C. Bunbury, Bt., M.P.
Rt. Hon. Earl of Orford	Sir Wm. Fordyce
Rt. Hon. Lord Rivers	John Hunter, Esq.

DIRECTORS

Sir John Ingilby, Bt., M.P.	J. Gretton, Esq.
Sir H. P. St. John Mildmay, Bt.	Dr. Hamilton
G. M. Ascough, Esq.	Mr. Kennett
Mr. J. Baynes	Dr. D. Mapleton
F. J. Brown, Esq., M.P.	Granville Penn, Esq.
Mr. J. Burgess	Mr. W. Stone
Rev. Thomas Burgess	E. Topham, Esq.
Rev. J. Cook	Dr. Williams
Dr. Crawford	J. Wollaston, Esq.

TREASURERS

Messrs. Ransome, Moreland, and Hammersley

PROFESSOR

Mr. St. Bel

Secretary: Mr. J. Huntingford

It is noteworthy that the name of John Hunter here appears for the first time. There is ample evidence that he was very interested and active in his support from this date forward but it has not been possible to find any documentary evidence that he had helped to initiate the scheme, as has been suggested elsewhere.

It is submitted that this brief survey shows that Thomas Burgess in 1785 whilst Tutor and Fellow of Corpus Christi, Oxford, initiated the move in the

(*Concluded at foot of col. 1 overleaf*)

A Note on Jaundice in Housed Sheep

BY

C. D. BRACEWELL

Agricultural Research Council, Field Station, Compton, Berks

SUMMARY.—(1) *24 out of 720 ewes housed at the A.R.C. Field Station, Compton, died after a brief illness in which the characteristic sign was jaundice. Ten of these were Romney Marsh, 5 Border Leicester, and 4 Clun Forest.*

(2) *All sheep had received a mineral supplement containing 1,430 p.p.m. DM of copper.*

(3) Post-mortem *findings included an enlarged and yellow liver, and enlarged and dark purple kidneys. Swelling and degeneration of liver cells, presence of certain characteristic "pigmented reticulum cells" in the liver, and degeneration of the convoluted tubules of the kidney, were the main histological lesions.*

(4) *Liver copper values were abnormally high.*

(5) *There are many similarities between this disease and descriptions of "chronic copper poisoning." It is suggested that at Compton other factors apart from intake of copper were involved in the appearance of the fatal syndrome.*

Introduction

BETWEEN June, 1956, and May, 1957, 24 cases of a rapidly fatal disease characterised by jaundice occurred among ewes housed for experimental purposes at the Agricultural Research Council Field Station, Compton.

This note describes the disease and the investigations that were made in an attempt to determine its cause.

History of the Animals Involved

All the cases of jaundice occurred in 6 breeds (10 Romney Marsh, 5 Border Leicester, 4 Clun Forest, 2 South Devon, 2 Ryeland, and 1 Exmoor Horn) from a batch of 720 ewes of 24 breeds that were assembled at the Field Station between September, 1955, and January, 1956, and were housed in isolation buildings. The first 15 cases occurred in June, 1956. Subsequently 2 cases occurred in July, 2 in October, 2 in March, 1957, 2 in April, and 1 in May. The cases occurred in widely separated buildings. None of the ewes were pregnant at the times when they contracted the disease.

Feeding

All sheep received similar food, consisting of hay and a concentrate mixture of equal parts of crushed oats, flaked maize, bran, and linseed cake, with 3 per cent. of a proprietary mineral supplement* containing 1,430 p.p.m. DM of copper; grass, kale, or mangolds, according to season, were fed in addition. The mineral supplement was withheld 2 weeks after the first case occurred. It was again added to the diet 4 months later but copper was omitted in view of the possibility that the disease was due to copper poisoning (Pearson, 1956; Gordon & Luke, 1957; Shand & Lewis, 1957). In spite of this absence of mineral copper 7 further cases of jaundice occurred, 4, 9, 10, and 11 months later.

Clinical Features

The onset of illness was sudden and the course rapid, resulting in death between 12 hours and 5 days after symptoms were noted. The general symptoms were sudden loss of appetite, reluctance to move, inability to stand, and terminal dyspnoea. The body temperature varied between 101° and 104.5° F. There was always obvious jaundice. The urine was dark red-brown. The faeces were brown, usually soft and sticky, and not formed into pellets. Two cases showed nodding and twitching of the head and neck and clonic spasms of the facial muscles.

Treatment

All cases were fatal and no treatment used affected the course of the disease. Antibacterial drugs, including penicillin, streptomycin, and sulphadimidine, were used on the earlier cases. Later cases received intravenous glucose, vitamin B_{12}, and an iron-containing tonic. Two cases were slaughtered without treatment.

Post-mortem Findings

The *carcase* was usually in good condition, with large fat deposits. The fat and skin were deep yellow. In two cases a striking feature was the presence of numerous bright yellow flakes a few millimetres in diameter, scattered amongst the fatty tissues throughout the body. The *skeletal muscles* were usually congested and red-brown. The *liver*

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Thomas Burgess.—*Concluded.*

Odiham Agricultural Society which led to the formation of the Veterinary College, London. In this work he was joined four years later by another subscribing member, Granville Penn, late of Magdalen, Oxford, and finally, in the same year, by an Honorary and Corresponding Member of the Society, Monsieur Charles Vial de St. Bel.

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was enlarged and its colour was yellow ochre or vandyke brown. The *gall-bladder* was usually of normal size, but was sometimes very large; in these latter cases there were no visible causes of stenosis such as fibrous constrictions or calculi, and when the bladder was compressed bile came freely from the papillary orifice. The *stomach and intestines* were usually pale and yellowish, but in some cases the whole gastro-intestinal tract was severely congested and the mucosa haemorrhagic. The ruminal contents were variable in consistency. The contents of both large and small intestines were more brown than normal. The rectal contents were usually soft, mucoid, and brown, but sometimes were hard, dark brown, and adherent to the mucosa. The *spleen* was enlarged and congested. The kidneys were enlarged and dark purple; on section, the boundary between cortex and medulla was indistinct due to the general dark brown or purple colour. The urine was dark red-brown or brown. In many cases the lungs were severely congested, with a copious bloody exudate in the bronchi and trachea; there was no congestion, however, in the two cases which were slaughtered. Those cases in which the lungs were congested also showed subcutaneous and subserous haemorrhages; these changes were not correlated with the occasional inflammation of the gastro-intestinal tract noted above.

Bacteriology

Aerobic and anaerobic culture at 37° C. on Bactotryptose ox-blood agar of heart-blood, lung, liver, kidney, and spleen failed to reveal any organism of known pathogenic importance.

Histology

Tissues from 12 cases were examined histologically. Fixation was in 10 per cent. formol-saline, or in absolute alcohol for the Gomori and rubeanic acid staining methods. Significant changes were found in the liver and kidney. Centrilobular or diffuse degeneration of liver cells, consisting of fatty and hydropic vacuolation, swelling, loss of staining power, and sometimes complete necrosis, was found in all liver sections. These changes were associated with distortion of liver-cell columns and constriction of sinusoids. The portal areas were infiltrated by macrophages, round cells, and fibroblasts. A constant and characteristic feature was the presence, usually within Glisson's capsule, of small groups of large pigmented cells (Fig. 1) closely similar to the "pigmented reticulum cells" described by De Kock (1928) in "enzootic icterus" of sheep in South Africa. Granular aggregates staining bright yellow with the haematoxylin and eosin method were found in liver cells and bile canaliculi; it was considered probable that this substance was bile pigment. Kupffer cells were not prominent, and erythrophagocytosis was not noted. The Gomori staining method failed to reveal ferric salts, and the rubeanic acid method did not demonstrate copper. Silver staining did not show spirochaetes. All sections of kidney showed amorphous eosinophilic material and red blood cells in the convoluted tubules and degenerative changes in the tubular epithelium. Tubular dilatation was common, and glomerular degeneration was sometimes noted. Ferric salts were demonstrated in the epithelium of convoluted tubules.

Liver Copper Values

Dr. Ruth Allcroft and Miss Gwyneth Lewis of the Biochemistry Department of the Veterinary Laboratory, Weybridge, kindly measured the liver copper contents of 6 animals. These values were considered to be abnormally high, namely 1,700, 1,100, 1,400, 1,600, 2,100, and 1,600 parts per million dry matter.

Discussion

The symptoms and *post-mortem* findings of this disease agree with descriptions of "chronic copper poisoning" in Great Britain (Pearson, 1956). The liver copper values support the similarity.

The most obvious source of copper was the mineral supplement. Assuming an average consumption of 2 lb. of concentrate mixture per sheep per day, then the average amount of copper received daily in this way was approximately 0.04 gramme. This is equivalent to approximately 0.16 gramme of hydrated copper sulphate. This intake of copper is below any described for the experimental production of copper poisoning. Eden (1940) used doses of 1.5 grammes of copper sulphate per day. However, the lower limit of toxicity has not been clearly established. Pearson (1956) considered the intake of 0.6 gramme of copper sulphate per day, which was the level in the outbreak he described, to be toxic.

A diagnosis of chronic copper poisoning due to overfeeding of copper may be a convenient one at the present time, but we feel that it is provisional. Very similar diseases have been described in Australia (Anon, 1956) and South Africa (De Kock, 1928) in which high liver copper contents have apparently been built up on diets containing minute amounts of copper.

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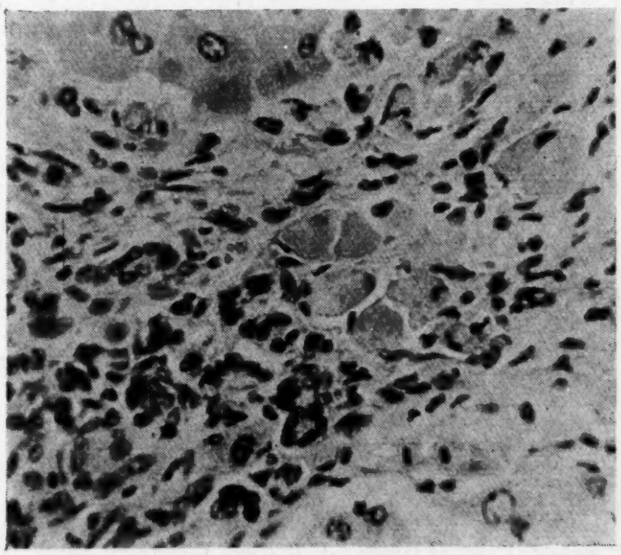

FIG. 1.—High power of liver, portal area, stained haematoxylin and eosin, showing a group of "De Kock's cells."

News and Comment

THE WEST OF SCOTLAND DIVISION CENTENARY DINNER

The Centenary Dinner of the West of Scotland Division of the B.V.A. was held at St. Enoch's Hotel, Glasgow, on Friday, April 11th. The President of the Division, Mr. Alex. Thomson, who was in the Chair, was accompanied by Mrs. Thomson.

The toast of the "Royal College of Veterinary Surgeons and the British Veterinary Association" was proposed by Mr. A. D. Campbell, President of the Scottish Branch and of the Dumfries and Galloway Division, and Dr. R. F. Montgomerie and Mr. J. McConnachie Ingram replied on behalf of the President of the Royal College and the B.V.A., respectively. "The West of Scotland Division" was proposed by Mr. A. L. Wilson, representing the Ayrshire Division, and "Our Guests" by Mr. Sydney Jennings. Mr. Thomson replied on behalf of the host Division, and Professor Alex. Robertson for the guests.

The Dinner was followed by a dance and among the other guests present were the Presidents of the North of Scotland and the Scottish Metropolitan Divisions, the Principal of the West of Scotland Agricultural College, and the General Secretary of the B.V.A.

The West of Scotland Division is to be congratulated on being the first Division of the B.V.A. to celebrate its Centenary and also on the excellent arrangements made for this memorable occasion.

THE ROYAL SOCIETY OF HEALTH CONGRESS

The programme for the Veterinary Hygiene Section at the R.S.H. Congress at Eastbourne on Wednesday, April 30th, includes a Presidential Address by Professor R. Lovell and a Symposium dealing with "Some of the Lesser Known Diseases Common to Man and Animals." The meeting commences at 2.30 p.m. and it will be held in the Winter Garden Pavilion.

FOOT-AND-MOUTH DISEASE

Restrictions on the movement and marketing of livestock in the Infected Area around Worplesdon, Nr. Guildford, Surrey, have been withdrawn as from April 11th.

The 2 outbreaks in this Area involved the slaughter of 188 cattle, 154 sheep, and 218 pigs.

THE REGISTER OF VETERINARY SURGEONS

The under-mentioned graduates were admitted to membership of the Royal College on the dates indicated:—

BLACKBURN, John Trevor, 33, Keresforth Hall Road, Barnsley, Yorks, April 9th, 1958, B.VET.MED. (LOND.); BOWEN, John Meirion, 68, Haverstock Hill, Hampstead, London, N.W.3, April 9th, 1958, B.VET.MED. (LOND.); CHEYNE, Ian Alexander, 44, The Grove, Upminster, Essex, April 9th, 1958, B.VET.MED. (LOND.); GALE, Vincent George, Holly Gate, Old Road, Welton, Brough, E.R. Yorks, April 9th, 1958, B.VET.MED. (LOND.); GRAY, Douglas Francis, Baybridge, Victoria Road, St. Austell, Cornwall, April 9th, 1958, B.VET.MED. (LOND.); HOLT, Eric Arthur, 118, Castleview Gardens, Ilford, Essex, April 9th, 1958, B.VET.MED. (LOND.); JENKERSON, Paul Richard, 27, Cliftonville Road, Pakefield, Lowestoft, Suffolk, April 9th, 1958, B.VET.MED. (LOND.); LITTLE, Neil Roy Forster, 40, Croydon Road, Reigate, Surrey, April 9th, 1958, B.VET.MED. (LOND.); SOUTHERTON, Anthony George, 64, Comet Drive, Shrewsbury, April 9th, 1958, B.VET.MED. (LOND.); TOWNLEY, Michael Herbert Ajderian, Cliff Lodge, Glanrafon Avenue, Llandudno, N. Wales, April 9th, 1958, B.VET.MED. (LOND.); WEETMAN, Peter Albert, 50, Rectory Road, Sutton Coldfield, Warwicks, April 9th, 1958, B.VET.MED. (LOND.); WILDGOOSE, John Douglas, c/o Lloyds Bank Ltd., Pangbourne, Berks, April 9th, 1958, B.VET.MED. (LOND.).

PERSONAL

Births

BICKNELL.—On April 4th, 1958, at Tiverton, Devon, to Constance, wife of S. R. Bicknell, B.V.M.S., M.R.C.V.S., a daughter, Leslie Craig.

DAVISON.—On April 6th, 1958, at Sandleford, Newbury, to Margaret, wife of Roy S. Davison, a daughter, Nicola Anne.

Engagements

SERTH—STEINER.—Mr. G. W. Serth, M.R.C.V.S., of Chaldon, Caterham, to Miss Elizabeth Steiner of Kenley, Surrey.

SLOAN—CAMPBELL.—Mr. W. H. Sloan, B.SC., M.R.C.V.S., son of Mrs. M. Sloan, Midbrae, Balerno, Midlothian, and the late Dr. A. T. Sloan, D.S.O., and Miss R. A. Campbell, daughter of Mr. I. M. Campbell, C.B.E., Balblair, Invershin, Sutherland, and the late Mrs. R. A. Campbell.

A Note on Jaundice in Housed Sheep.—*Concluded.*

These sheep at Compton underwent a drastic change in husbandry when brought into permanent housing. This may have been a contributory cause. However, cases occurred as long as 18 months after arrival, and ten months after stopping the feeding of copper, suggesting that still other, unknown factors were involved in the appearance of the clinical disease.

Acknowledgments.—My thanks are due to Dr. Ruth Allcroft and Miss Gwyneth Lewis of the Department of Biochemistry, the Veterinary Laboratory, Weybridge for their kindness in estimating the levels of copper in the liver, and advising me on the significance of the results, and to Mr. I. H. Pattison for his interest and advice at all times.

References

ANON. (1956). *Aust. Vet. J.* **32.** 229.
DE KOCK, G. (1928). 13th and 14th reports of the Dir. of Vet. Ed. and Res., Onderstepoort. October, 1928.
EDEN, A. (1940). *J. Comp. Path.* **53.** 90.
GORDON, W. A. M., & LUKE, D. (1957). *Vet. Rec.* **69.** 37.
PEARSON, J. K. L. (1956). *Vet. Rec.* **68.** 766.
SHAND, A., & GWYNETH LEWIS. (1957). *Vet. Rec.* **69.** 618.

COMING EVENTS

April

23rd (Wed.). Meeting of the Lincolnshire and District Division at the Campbell Hotel, Peterborough, 2.30 p.m.

Meeting of the Warwickshire Veterinary Club at the Regent Hotel, Leamington Spa, 8 p.m.

24th (Thurs.). Meeting of the Essex Veterinary Society at the Essex Institute of Agriculture, Writtle, 7.30 p.m.

25th (Fri.). General Meeting of the Mid-West Veterinary Association at the Berkeley Café, Clifton, Bristol, 2.30 p.m.

General Meeting of the Yorkshire Veterinary Society in York, commencing in the Attested Ring at York Market, 2.30 p.m., and continuing in the City Arms Hotel, Fawcett Street.

26th (Sat.). Annual General Meeting of the Association of State Veterinary Officers in the auditorium of the Wellcome Research Institute, 183-193, Euston Road, London, N.W.1, 4 p.m., followed by the Annual Dinner at the Café Royal, 6.30 p.m.

30th (Wed.). First Meeting of the B.S.A.V.A. Eastern Region No. 3 at the "University Arms" Hotel, Cambridge, 7 p.m.

Meeting of the Veterinary Hygiene Section at the Royal Society of Health Congress in the Winter Garden Pavilion, Eastbourne, 2.30 p.m.

May

1st (Thurs.). Annual General Meeting of the Central Veterinary Society at the Royal Veterinary College, Camden Town, N.W.1, 6 p.m.

8th (Thurs.). General Meeting of the Lancashire Veterinary Association in Room 48, Victoria Building, University of Liverpool, 2.30 p.m.

9th (Fri.). Meeting of the R.A.V.C. Division at the R.A.V.C. School and Stores, Thornhill, Aldershot, 12 noon.

10th (Sat.). Annual Dinner-Dance of the Chiron Club at the Royal Hotel, Bristol, 6.30 p.m.

Annual General Meeting of the Scottish Regional Group of the A.V.T. & R.W.'s at the University of Glasgow Veterinary Hospital, Bearsden Road, Bearsden, Glasgow, 10.45 a.m.

10th and 11th (Sat. and Sun.). 6th Annual Reunion of the R.V.C. '52 Club at Ye Miller of Mansfield, Goring-on-Thames.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Ches. Nun House Farm, Crook Lane, Winsford (Apr. 8).
Leics. Piper Hole Farm, Scalford, Melton Mowbray (Apr. 10).

Atrophic Rhinitis

Suffolk. Stanway Green Farm, Worlingworth, Woodbridge (Apr. 8).

Foot-and-mouth Disease

Glos. 56, Acres, Nordrach-on-Mendip, Blagdon, Bristol (Apr. 9).
Lancs. Co-operative Wholesale Society Ltd., Show House, Abattoir Farm, Whalley, Blackburn (Apr. 7).
Norfolk. Park Farm, Costessey, Norwich (Apr. 4); Dairy Farm, Ranworth, Norwich (Apr. 6); Home Farm, Horsford, Norwich; Murrayfield, Old Costessey, Norwich (Apr. 9).

Fowl Pest

Essex. Tidings Hill, Halstead (Apr. 4); Dial Stone Cottage, Thorpe Road, Great Clacton, Clacton-on-Sea (Apr. 8).
Herts. Holly Lane Poultry Farm, Bowers Heath, Harpenden (Apr. 10).
Hunts. Old Tiles, Fenstanton (Apr. 7).
Lancs. Rakes Farm, Freckleton, Preston (Apr. 3).
Northants. Charity Land Meadows, Yarwell, Peterborough (Apr. 3); The Guest House Buildings, Elmington, Oundle, Peterborough; Elmington Lodge Guest House, Elmington, Oundle, Peterborough (Apr. 4); 35, Field Terrace, Farcet, Peterborough (Apr. 7); 90, Main Street, Farcet, Peterborough (Apr. 10).
Sussex. Little Funnells Farm, Maynards Green, Horam (Apr. 10).

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

Summaries of Articles

Sir,—THE RECORD of February 15th had a note on a suggested monthly service of reprints of summaries of articles from THE RECORD for those engaged in teaching or research work and in your journal of March 1st you invite expressions of opinion on this suggestion.

While I have no doubt that a supply of reprints of summaries of articles published in THE RECORD would be useful to some, I feel that our *Veterinary Bulletin* is already providing a service on the same lines which covers not only THE RECORD but the veterinary and ancillary literature from all parts of the world. The *Veterinary Bulletin* has a definite bias towards the research, educational, and public health aspects of veterinary science but does not ignore the clinical aspects.

The *Veterinary Bulletin* is issued monthly, the annual subscription is 70s. (less a 20 per cent. discount for orders from the U.K. and other Commonwealth countries) and it contains some 4,000 abstracts each year. Deducting the discount the cost comes

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Tissues from 12 cases were examined histologically. Fixation was in 10 per cent. formol-saline, or in absolute alcohol for the Gomori and rubeanic acid staining methods. Significant changes were found in the liver and kidney. Centrilobular or diffuse degeneration of liver cells, consisting of fatty and hydropic vacuolation, swelling, loss of staining power, and sometimes complete necrosis, was found in all liver sections. These changes were associated with distortion of liver-cell columns and constriction of sinusoids. The portal areas were infiltrated by macrophages, round cells, and fibroblasts. A constant and characteristic feature was the presence, usually within Glisson's capsule, of small groups of large pigmented cells (Fig. 1) closely similar to the "pigmented reticulum cells" described by De Kock (1928) in "enzootic icterus" of sheep in South Africa. Granular aggregates staining bright yellow with the haematoxylin and eosin method were found in liver cells and bile canaliculi; it was considered probable that this substance was bile pigment. Kupffer cells were not prominent, and erythrophagocytosis was not noted. The Gomori staining method failed to reveal ferric salts, and the rubeanic acid method did not demonstrate copper. Silver staining did not show spirochaetes. All sections of kidney showed amorphous eosinophilic material and red blood cells in the convoluted tubules and degenerative changes in the tubular epithelium. Tubular dilatation was common, and glomerular degeneration was sometimes noted. Ferric salts were demonstrated in the epithelium of convoluted tubules.

Liver Copper Values

Dr. Ruth Allcroft and Miss Gwyneth Lewis of the Biochemistry Department of the Veterinary Laboratory, Weybridge, kindly measured the liver copper contents of 6 animals. These values were considered to be abnormally high, namely 1,700, 1,100, 1,400, 1,600, 2,100, and 1,600 parts per million dry matter.

Discussion

The symptoms and *post-mortem* findings of this disease agree with descriptions of "chronic copper poisoning" in Great Britain (Pearson, 1956). The liver copper values support the similarity.

The most obvious source of copper was the mineral supplement. Assuming an average consumption of 2 lb. of concentrate mixture per sheep per day, then the average amount of copper received daily in this way was approximately 0.04 gramme. This is equivalent to approximately 0.16 gramme of hydrated copper sulphate. This intake of copper is below any described for the experimental production of copper poisoning. Eden (1940) used doses of 1.5 grammes of copper sulphate per day. However, the lower limit of toxicity has not been clearly established. Pearson (1956) considered the intake of 0.6 gramme of copper sulphate per day, which was the level in the outbreak he described, to be toxic.

A diagnosis of chronic copper poisoning due to overfeeding of copper may be a convenient one at the present time, but we feel that it is provisional. Very similar diseases have been described in Australia (Anon, 1956) and South Africa (De Kock, 1928) in which high liver copper contents have apparently been built up on diets containing minute amounts of copper.

(*Concluded at foot of col. 1 overleaf*)

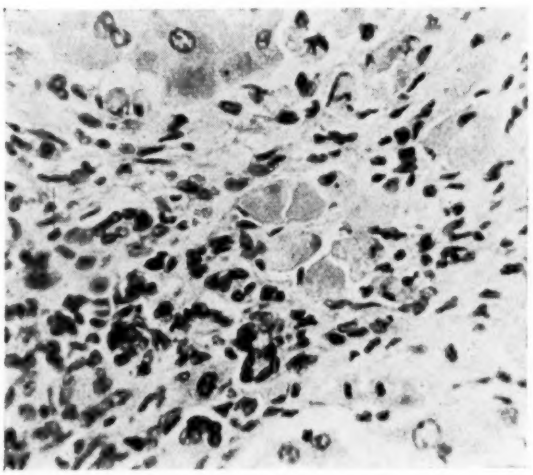

FIG. 1.—High power of liver, portal area, stained haematoxylin and eosin, showing a group of "De Kock's cells."

News and Comment

THE WEST OF SCOTLAND DIVISION CENTENARY DINNER

The Centenary Dinner of the West of Scotland Division of the B.V.A. was held at St. Enoch's Hotel, Glasgow, on Friday, April 11th. The President of the Division, Mr. Alex. Thomson, who was in the Chair, was accompanied by Mrs. Thomson.

The toast of the "Royal College of Veterinary Surgeons and the British Veterinary Association" was proposed by Mr. A. D. Campbell, President of the Scottish Branch and of the Dumfries and Galloway Division, and Dr. R. F. Montgomerie and Mr. J. McConnachie Ingram replied on behalf of the President of the Royal College and the B.V.A., respectively. "The West of Scotland Division" was proposed by Mr. A. L. Wilson, representing the Ayrshire Division, and "Our Guests" by Mr. Sydney Jennings. Mr. Thomson replied on behalf of the host Division, and Professor Alex. Robertson for the guests.

The Dinner was followed by a dance and among the other guests present were the Presidents of the North of Scotland and the Scottish Metropolitan Divisions, the Principal of the West of Scotland Agricultural College, and the General Secretary of the B.V.A.

The West of Scotland Division is to be congratulated on being the first Division of the B.V.A. to celebrate its Centenary and also on the excellent arrangements made for this memorable occasion.

THE ROYAL SOCIETY OF HEALTH CONGRESS

The programme for the Veterinary Hygiene Section at the R.S.H. Congress at Eastbourne on Wednesday, April 30th, includes a Presidential Address by Professor R. Lovell and a Symposium dealing with "Some of the Lesser Known Diseases Common to Man and Animals." The meeting commences at 2.30 p.m. and it will be held in the Winter Garden Pavilion.

FOOT-AND-MOUTH DISEASE

Restrictions on the movement and marketing of livestock in the Infected Area around Worplesdon, Nr. Guildford, Surrey, have been withdrawn as from April 11th.

The 2 outbreaks in this Area involved the slaughter of 188 cattle, 154 sheep, and 218 pigs.

THE REGISTER OF VETERINARY SURGEONS

The under-mentioned graduates were admitted to membership of the Royal College on the dates indicated:—

BLACKBURN, John Trevor, 33, Keresforth Hall Road, Barnsley, Yorks, April 9th, 1958, B.VET.MED. (LOND.); BOWEN, John Meirion, 68, Haverstock Hill, Hampstead, London, N.W.3, April 9th, 1958, B.VET.MED. (LOND.); CHEYNE, Ian Alexander, 44, The Grove, Upminster, Essex, April 9th, 1958, B.VET.MED. (LOND.); GALE, Vincent George, Holly Gate, Old Road, Welton, Brough, E.R. Yorks, April 9th, 1958, B.VET.MED. (LOND.); GRAY, Douglas Francis, Baybridge, Victoria Road, St. Austell, Cornwall, April 9th, 1958, B.VET.MED. (LOND.); HOLT, Eric Arthur, 118, Castleview Gardens, Ilford, Essex, April 9th, 1958, B.VET.MED. (LOND.); JENKERSON, Paul Richard, 27, Cliftonville Road, Pakefield, Lowestoft, Suffolk, April 9th, 1958, B.VET.MED. (LOND.); LITTLE, Neil Roy Forster, 40, Croydon Road, Reigate, Surrey, April 9th, 1958, B.VET.MED. (LOND.); SOUTHERTON, Anthony George, 64, Comet Drive, Shrewsbury, April 9th, 1958, B.VET.MED. (LOND.); TOWNLEY, Michael Herbert Ajderian, Cliff Lodge, Glanrafon Avenue, Llandudno, N. Wales, April 9th, 1958, B.VET.MED. (LOND.); WEETMAN, Peter Albert, 50, Rectory Road, Sutton Coldfield, Warwicks, April 9th, 1958, B.VET.MED. (LOND.); WILDGOOSE, John Douglas, c/o Lloyds Bank Ltd., Pangbourne, Berks, April 9th, 1958, B.VET.MED. (LOND.).

PERSONAL

Births

BICKNELL.—On April 4th, 1958, at Tiverton, Devon, to Constance, wife of S. R. Bicknell, B.V.M.S., M.R.C.V.S., a daughter, Leslie Craig.

DAVISON.—On April 6th, 1958, at Sandleford, Newbury, to Margaret, wife of Roy S. Davison, a daughter, Nicola Anne.

Engagements

SERTH—STEINER.—Mr. G. W. Serth, M.R.C.V.S., of Chaldon, Caterham, to Miss Elizabeth Steiner of Kenley, Surrey.

SLOAN—CAMPBELL.—Mr. W. H. Sloan, B.SC., M.R.C.V.S., son of Mrs. M. Sloan, Midbrae, Balerno, Midlothian, and the late Dr. A. T. Sloan, D.S.O., and Miss R. A. Campbell, daughter of Mr. I. M. Campbell, C.B.E., Balblair, Inversbin, Sutherland, and the late Mrs. R. A. Campbell.

A Note on Jaundice in Housed Sheep.—*Concluded.*

These sheep at Compton underwent a drastic change in husbandry when brought into permanent housing. This may have been a contributory cause. However, cases occurred as long as 18 months after arrival, and ten months after stopping the feeding of copper, suggesting that still other, unknown factors were involved in the appearance of the clinical disease.

Acknowledgments.—My thanks are due to Dr. Ruth Allcroft and Miss Gwyneth Lewis of the Department of Biochemistry, the Veterinary Laboratory, Weybridge for their kindness in estimating the levels of copper in the liver, and advising me on the significance of the results, and to Mr. I. H. Pattison for his interest and advice at all times.

References

ANON. (1956). *Aust. Vet. J.* **32**. 229.
DE KOCK, G. (1928). 13th and 14th reports of the Dir. of Vet. Ed. and Res., Onderstepoort. October, 1928.
EDEN, A. (1940). *J. Comp. Path.* **53**. 90.
GORDON, W. A. M., & LUKE, D. (1957). *Vet. Rec.* **69**. 37.
PEARSON, J. K. L. (1956). *Vet. Rec.* **68**. 766.
SHAND, A., & GWYNETH LEWIS. (1957). *Vet. Rec.* **69**. 618.

COMING EVENTS

April

23rd (Wed.). Meeting of the Lincolnshire and District Division at the Campbell Hotel, Peterborough, 2.30 p.m.

Meeting of the Warwickshire Veterinary Club at the Regent Hotel, Leamington Spa, 8 p.m.

24th (Thurs.). Meeting of the Essex Veterinary Society at the Essex Institute of Agriculture, Writtle, 7.30 p.m.

25th (Fri.). General Meeting of the Mid-West Veterinary Association at the Berkeley Café, Clifton, Bristol, 2.30 p.m.

General Meeting of the Yorkshire Veterinary Society in York, commencing in the Attested Ring at York Market, 2.30 p.m., and continuing in the City Arms Hotel, Fawcett Street.

26th (Sat.). Annual General Meeting of the Association of State Veterinary Officers in the auditorium of the Wellcome Research Institute, 183-193, Euston Road, London, N.W.1, 4 p.m., followed by the Annual Dinner at the Café Royal, 6.30 p.m.

30th (Wed.). First Meeting of the B.S.A.V.A. Eastern Region No. 3 at the "University Arms" Hotel, Cambridge, 7 p.m.

Meeting of the Veterinary Hygiene Section at the Royal Society of Health Congress in the Winter Garden Pavilion, Eastbourne, 2.30 p.m.

May

1st (Thurs.). Annual General Meeting of the Central Veterinary Society at the Royal Veterinary College, Camden Town, N.W.1, 6 p.m.

8th (Thurs.). General Meeting of the Lancashire Veterinary Association in Room 48, Victoria Building, University of Liverpool, 2.30 p.m.

9th (Fri.). Meeting of the R.A.V.C. Division at the R.A.V.C. School and Stores, Thornhill, Aldershot, 12 noon.

10th (Sat.). Annual Dinner-Dance of the Chiron Club at the Royal Hotel, Bristol, 6.30 p.m.

Annual General Meeting of the Scottish Regional Group of the A.V.T. & R.W.'s at the University of Glasgow Veterinary Hospital, Bearsden Road, Bearsden, Glasgow, 10.45 a.m.

10th and 11th (Sat. and Sun.). 6th Annual Reunion of the R.V.C. '52 Club at Ye Miller of Mansfield, Goring-on-Thames.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Ches. Nun House Farm, Crook Lane, Winsford (Apr. 8).
Leics. Piper Hole Farm, Scalford, Melton Mowbray (Apr. 10).

Atrophic Rhinitis

Suffolk. Stanway Green Farm, Worlingworth, Woodbridge (Apr. 8).

Foot-and-mouth Disease

Glos. 56, Acres, Nordrach-on-Mendip, Blagdon, Bristol (Apr. 9).
Lancs. Co-operative Wholesale Society Ltd., Show House, Abattoir Farm, Whalley, Blackburn (Apr. 7).
Norfolk. Park Farm, Costessey, Norwich (Apr. 4); Dairy Farm, Ranworth, Norwich (Apr. 6); Home Farm, Horsford, Norwich; Murrayfield, Old Costessey, Norwich (Apr. 9).

Fowl Pest

Essex. Tidings Hill, Halstead (Apr. 4); Dial Stone Cottage, Thorpe Road, Great Clacton, Clacton-on-Sea (Apr. 8).
Herts. Holly Lane Poultry Farm, Bowers Heath, Harpenden (Apr. 10).
Hunts. Old Tiles, Fenstanton (Apr. 7).
Lancs. Rakes Farm, Freckleton, Preston (Apr. 3).
Northants. Charity Land Meadows, Yarwell, Peterborough (Apr. 3); The Guest House Buildings, Elmington, Oundle, Peterborough; Elmington Lodge Guest House, Elmington, Oundle, Peterborough (Apr. 4); 35, Field Terrace, Farcet, Peterborough (Apr. 7); 90, Main Street, Farcet, Peterborough (Apr. 10).
Sussex. Little Funnells Farm, Maynards Green, Horam (Apr. 10).

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

Summaries of Articles

Sir,—THE RECORD of February 15th had a note on a suggested monthly service of reprints of summaries of articles from THE RECORD for those engaged in teaching or research work and in your journal of March 1st you invite expressions of opinion on this suggestion.

While I have no doubt that a supply of reprints of summaries of articles published in THE RECORD would be useful to some, I feel that our *Veterinary Bulletin* is already providing a service on the same lines which covers not only THE RECORD but the veterinary and ancillary literature from all parts of the world. The *Veterinary Bulletin* has a definite bias towards the research, educational, and public health aspects of veterinary science but does not ignore the clinical aspects.

The *Veterinary Bulletin* is issued monthly, the annual subscription is 70s. (less a 20 per cent. discount for orders from the U.K. and other Commonwealth countries) and it contains some 4,000 abstracts each year. Deducting the discount the cost comes

to 57s. which is not much more than the tentative figure of £2 2s. which you suggest as the cost of the proposed new service.

The *Veterinary Bulletin* provides a unique service, it is subsidised by contributions from all parts of the British Commonwealth and, judging by our distribution list, seems to be highly appreciated by veterinarians all over the world.

May I be excused if I suggest that it seems to me to be unnecessary to inaugurate another service which would cover only a small part of a field already covered?

If any readers of THE RECORD do not already know the *Veterinary Bulletin* I would be very glad to send a specimen copy and further particulars on request.

Yours faithfully,
M. CRAWFORD.

Commonwealth Bureau of Animal Health,
Veterinary Laboratory,
Ministry of Agriculture, Fisheries and Food,
New Haw,
Weybridge,
Surrey.

March 17th, 1958.

Veterinary Education in East Africa

Sir,—The British Council has at times sustained a lot of criticism from the press, but as a profession we should be thankful that at least a modicum of the taxpayers' money has been used to meet the expenses of some of our more illustrious members' trips abroad. This is all to the good for it is said that travel broadens the mind and I am certain that these personal contacts with veterinary activities in the Empire and Commonwealth, fleeting though they be, achieve this end.

The visitors will, no doubt, find everything laid on and all modern amenities available, but in the midst of all this comfort they should not forget the early work and the struggles which were necessary to get the profession established and recognised in these countries. Life was not always so easy. The recent delegation from the R.C.V.S. and London University consisting of experts on veterinary education in Africa* prompts me to bring to the notice of the profession the background which has now enabled the Veterinary School of East Africa to attract such august attention!

Makerere College, the University College of East Africa, of which the Veterinary School is a part, commenced operations in the middle twenties, and in 1927 I was instructed to plan a suitable course in veterinary science. Although there was no staff and no accommodation there was one student and three others were promised.

Until the Research Laboratory at Entebbe became available the problem of teaching was solved by taking the students on safari and giving them practical instruction and lectures on anatomy and physiology in the bush!

Eventually the School was established at Entebbe where I remember we soon had the pleasure of meeting the Parliamentary Commission on Higher Education, under the Chairmanship of Earl de la Warr who, with Mr. Lennox Boyd, I see, was present at the select party given by the R.C.V.S. at the House of Commons on March 25th.

The Veterinary School was based on the laboratory because Research Officers were available as part-time lecturers, and this general system has worked very well up to the present time on the principle that research and education should be closely linked, though more whole-time lecturers in various subjects are now available. It is interesting to record here that Makerere College, in close co-operation with the Uganda Veterinary Department, was the first to establish a Veterinary School for Africans in connexion with a scheme for Higher Education, and that both the Sudan and West Africa later planned their schools on the Uganda model.

As time went on a hostel and further lecture rooms were built; the school developed and the standard of the course gradually improved. At first the students were all drawn from Uganda but later Kenya, Tanganyika, and Zanzibar were each represented and since the war many of the pre-war graduates have visited this country and one at least has qualified M.R.C.V.S.

It would not be fitting to conclude this very brief and inadequate note on veterinary education in East Africa without paying tribute to the late W. F. Poulton, Director of Veterinary Services, Uganda. He really initiated the organised training of Africans in veterinary science in Uganda and recommended the creation of the post of Veterinary Education Officer to which I was appointed in 1927, and with which I was associated as Dean of the Veterinary School and Member of the Academic Board of Makerere College until I left the service in 1945.

The late R. W. M. Mettam as Veterinary Pathologist at the time, gave great help in the establishment of the school and took over part of the lecturing. Other part-time lecturers at various times were D. L. O'Brian, M.R.C.V.S., C. P. Downes, M.R.C.V.S., R. N. T.-W.-Fiennes, B.A., M.R.C.V.S., and the late Lionel Lester, M.R.C.V.S. In later years, during the war, F. R. Bell, now Reader in Physiology at the Royal Veterinary College, undertook much of the teaching and succeeded me as Veterinary Member on the Academic Board.

At present the students divide their time between the College in Uganda and the Veterinary School which, since the war, has been moved from Entebbe to the Veterinary Research Laboratory at Kabete in Kenya.

Yours faithfully,
J. CARMICHAEL.

Boarded Barns Farm,
Ongar,
Essex.

April 8th, 1958.

* The names of the delegates can be found in THE VETERINARY RECORD of March 29th, page 284.